

Claims

- [c1] An external cavity laser comprising:
- a gain medium having a highly reflective facet and a highly transmissive facet ;
 - a cavity phase adjustor;
 - a retro-reflective etalon comprising:
 - (a) the first linear polarizer(if the emission light from the gain medium is substantially polarized, this polarizer is not necessary), the first quarter waveplate, the etalon filter, the second quarter waveplate, the second linear polarizer, the end mirror reflector;
 - (b) the end reflector arranged in substantial or perfect parallel to the etalon filter;
 - (c) the optical axes of the two quarter waveplates arranged in parallel or perpendicular;
 - (d) the first quarter waveplate to rotate the polarization of the light reflected from the etalon and the first polarizer to absorb the light;
 - (e) the second quarter waveplate to rotate the polarization of the light reflected from the etalon and the second polarizer to absorb the light;
 - the highly transmissive facet of the gain medium facing the retro-reflective etalon;

the light reflected back from the retro-reflective etalon being fed back into said gain medium;
the output light of the said laser from the end reflector of the retro-reflective etalon and the highly reflective facet of the gain medium.

- [c2] The laser of claim 1 wherein the highly reflective facet of the gain medium comprises one of a cleaved facet, a high reflection coated facet, a coated band-pass reflective filter on the facet, a coated special filter on the facet to compensate the gain profile of the gain medium.
- [c3] The laser of claim 1 wherein the highly transmissive facet of the gain medium comprises one of an angle cleaved facet, anti-reflection coated facet, angle cleaved and anti-reflective coated facet.
- [c4] The laser of claim 1 wherein the cavity phase adjustor is the means to adjust the cavity length to match the cavity mode(s) to the etalon peak(s).
- [c5] The laser of claim 1 wherein the etalon filter is an air-spaced etalon defined by a first partial reflector and a second partial reflector, said reflectors mounted in a parallel spaced-apart relationship to form a gap in between.
- [c6] The laser of claim 1 wherein the etalon filter is defined

by a first partial reflector and a second partial reflector, said reflectors formed on the two parallel surfaces of a piece of transparent material.

- [c7] The etalon filter of claim 5 wherein the optical path thickness of the transparent material can be changed thermally or by applying an electrical field or chosen thermally stable.
- [c8] The laser of claim 1 wherein the etalon filter is a thin film interference filter or a tapered thin film interference filter on a substrate of one transmission peak within a wavelength range defined by the requirement of single mode operation.
- [c9] The laser of claim 1 wherein the linear polarizer only lets light with the polarization in parallel to its optical axis to pass through substantially.
- [c10] The laser of claim 1 wherein the quarter waveplates are respectively made of a material selected from a group consisting of birefringent crystals and liquid crystals.
- [c11] The laser of the claim 1 wherein the reflector of the R-etalon comprises one of reflection filter, band-pass reflective filter, and the filter of special reflection spectrum to compensate the gain curve of the gain medium.